

SOCCER HEADING PERFORMANCE REVOLUTION: THE IMPACT OF SQUAT JUMP TRAINING ON THE JUMPING ABILITY OF PERSECO SAMAHANI CLUB ATHLETES

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ABSTRAK

Ability head the ball in football No only determined by mastery technique , but also by ability jump For reach the ball at a higher point high . Based on observation early , Perseco Club athletes Samahani Still show ability leap moment low header so that required form capable exercises increase Power explosion legs . Research This aim analyze impact exercise *squat jump* to ability jump moment heading the ball at Perseco Club athletes Samahani . Research use approach quantitative with method experiments and designs One group with test start and test end . All six twelve athlete made into sample through technique taking total sample . Treatment in the form of exercise *squat jump* given during six twelve meeting . Capability data leap collected use test leap vertical , then analyzed through

average value , standard deviation , and mean difference test. Research results show that average ability value leap increase from 231.37 on the test beginning to 240.31 on the test end . The results of the average difference test obtained mark statistics by 5.73, more tall than mark critical of 1.76, which shows existence influence exercise *squat jump* to ability leap moment heading the ball. Novelty study This lies in the implementation exercise *squat jump* in a way programmed with make ability leap moment headbutt as external main in context coaching athlete club football local . Findings This show that exercise *squat jump* can become alternative exercise For support performance heading the ball.

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INTRODUCTION

Soccer is a sport that demands players possess both technical ability and physical fitness. One technique that plays a crucial role in both attacking and defensive situations is heading the ball. Heading ability is not only related to the accuracy of the head's contact with the ball, but also requires the player's ability to jump optimally to reach the ball at a higher point. *Plyometric squat jump training* has been shown to improve *jump heading skills*

because the explosive movement of the legs stimulates the player's ability to produce a vertical jump (Styawan & Yunus, 2020) . The study showed that *squat jump training* resulted in a 2.8-centimeter increase in jump height in soccer players.

Jumping ability in soccer is closely related to leg muscle explosiveness. Explosiveness allows players to generate force in a short period of time, supporting various explosive movements, including jumping to head the ball. Plyometric training is one form of training widely used to develop this ability. Plyometric training programs provide greater benefits for improving vertical jump, linear running speed, and change of direction in soccer players than strength training alone (Hernandez-Martinez et al., 2025) . These findings suggest that training stimuli that emphasize explosive movements can be an important part of developing soccer players' physical abilities.

One form of plyometric training that is relatively simple and easy to implement is *the squat jump* . This exercise emphasizes the movement of bending the legs followed by an explosive push to perform a jump. In the context of soccer training, plyometric jump training needs to be programmed by considering the training volume, intensity, frequency, and characteristics of the player to ensure optimal training adaptation (Ilham et al., 2024) . Studies on variations of lower extremity training also show that plyometric training is an effective approach to increasing explosive power of the leg muscles of soccer players, so this training variation is recommended as part of a player performance improvement program (Alben et al., 2023) .

Recent empirical evidence further reinforces the importance of plyometric training in soccer. A six-week plyometric training program can improve vertical jump, *squat jump* , agility, and speed in young soccer players (Türkarslan & Deliceoglu, 2024) . Another study in male soccer players showed that eight weeks of vertical, horizontal, or a combination of both plyometric training can improve jumping performance and other physical components (Moran et al., 2024) . More specific findings also showed that *squat depth jump training* can improve the *heading ability* of Putra Buana Club players, as demonstrated by an increase in average *heading results* after participating in the training program (Ilham et al., 2024) .

The urgency of this research arose from the real-world situation found among Perseco Samahani Club athletes. Based on initial observations, not all players were able to head *the ball* effectively, and errors were still found during the movement. Jumping ability when heading was also still low, making it difficult for some players to reach the ball and head it accurately. This situation suggests that *heading problems* cannot be solved simply by

repeating heading techniques but must be supported by improvements in physical abilities, particularly explosive leg strength. This is increasingly relevant because recent evidence shows that plyometric training can significantly improve soccer players' jumping ability compared to routine soccer training without additional plyometric stimulation (Zheng et al., 2025) .

However, there are still research gaps that need to be addressed. Research (Styawan & Yunus, 2020) compared *squat jump* and *hurdle jump training* on *jump heading skills* , while (Ilham et al., 2024) examined *squat depth jumps* on *heading ability* . Other studies have evaluated plyometric training more specifically through general indicators such as vertical jump, speed, agility, change of direction, or leg muscle explosiveness. Thus, research into the application of *squat jumps* as a single training exercise specifically aimed at jumping ability during *heading* in local football club development environments is still worthy of further development. This gap is significant because improvements in overall jump test results do not always reflect their application to the specific technical needs of football.

The novelty of this research is contextual and applicable, not in the discovery of *squat jumps* as a new training method. The novelty lies in the application of *squat jump training* in a program for sixteen meetings with Perseco Samahani Club athletes, making jumping ability when heading the ball the main outcome. This approach provides empirical evidence in the context of local football club coaching regarding the extent to which a simple, easy-to-implement, and equipment-free form of training can support physical abilities directly related to *heading technique* . The selection of this training program is also in line with evidence that structured plyometric training can produce neuromuscular adaptations and improve football players' jumping ability (Zheng et al., 2025) .

Based on the aforementioned issues, urgency, research gaps, and novelty, this study aims to analyze the impact of *squat jump training* on the jumping ability when heading the ball in Perseco Samahani Club athletes. The results are expected to provide an empirical basis for coaches in determining practical training forms to improve jumping ability that supports heading performance while strengthening the application of technical-based physical training in football coaching.

RESEARCH METHODS

Study This use approach quantitative with method experiment. Experimental method used For know influence exercise *squat jump* to ability jump Perseco Club athletes Samahani. The research design used is a one-group pretest-posttest design, namely

research involving One group the sample provided test initial (*pretest*), then get treatment in the form of exercise *squat jump*, and so on given test end (*posttest*). Through design this , change ability jump athlete can known with compare results measurement before and after given treatment .

In a way simple design study can depicted as following :

$O_1 - X - O_2$

Description :

O_1 = *Pretest* ability jump before training *squat jump*

X = Treatment in the form of training *squat jump*

O_2 = *Posttest* ability jump after training *squat jump*

Population and Sample

Population in study This is all over Perseco Club athletes Samahani, which consists of 16 people. Considering amount population relatively limited, all member population used as sample research. Data collection techniques samples used is total sampling, namely technique determination sample with make all over member population as sample. With Thus, the number samples used in study This as many as 16 Perseco Club athletes Samahani .

Variables Study

Study This consists of on two variables, namely variables free and variable bound. Variable independent *variable* is *squat jump* exercise, while variables dependent *variable* is ability jump athlete in support skills heading the ball. *Squat jump exercise* given in a way programmed as treatment with objective increase Power explosion muscle legs so that athlete capable do more optimal jump when heading the ball.

Instrument Study

Instruments used For measure ability jump athlete is test leap vertical (*vertical jump test*). Test This used For know ability explosive muscle legs through achievement tall jump. Measurement done before treatment as *pretest* and posttest the entire training program finished as *posttest*. Implementation measurement on the test start and test end done with the same procedures and conditions so that the results measurement can compared to in a way consistent. In implementation, athletes moreover formerly do warmup For prepare condition physical and reduce risk injury. Athlete Then do test in accordance procedure measurement leap vertical. Measurement results every athlete noted as research data.

Pretest data describe ability beginning athlete before get exercise *squat jump*, while the *posttest data* describe ability jump after given treatment.

Procedure Study

Implementation study shared become three stage, namely test beginning, giving treatment and testing end. At the stage first, all sample follow *pretest* use test leap vertical for obtain capability data initial. Measurement beginning the become base for know condition ability jump athlete before follow an exercise program. Stage second is giving treatment in the form of exercise *squat jump*. Treatment given to all over sample as many as 16 meetings. The training was carried out in a way programmed and systematic with notice principle exercise, especially regularity implementation, improvement burden exercise in a way gradual, and conditions physique athlete. *Squat jump movement* done with position beginning stand up, then lower body with bend knee until position *squat*, continued with movement explosive in the form of leap vertical, then back to the position that has been determined For do repetition next. This exercise directed For increase strength explosive or *power* muscle the required legs in do leap moment heading the ball. Stage third is implementation *posttest*. After all over series exercise *squat jump* as many as 16 meetings finished implemented, athletes return undergo test leap vertical use the same procedure with *pretest*. Result data *posttest* Then compared to with *pretest* data For know change ability jump after given treatment.

Data Collection Techniques

Research data obtained through technique tests and measurements. Data collection was carried out twice, namely before and after treatment . First data obtained through *pretest* ability jump, while the second data obtained through *posttest* after athlete complete the training program *squat jump*. Whole results measurement recorded and then processed For know change ability each athlete's jump and change ability group in a way overall.

Data Analysis Techniques

Data obtained analyzed use analysis statistics descriptive and inferential analysis statistics descriptive used For know description results study through calculation mean and standard values deviation in *pretest* and *posttest* data. Comparison average value used For see trend improvement ability jump athlete after follow exercise *squat jump*. Next done analysis statistics inferential using the paired - *samples t*- test for two paired data, because

measurement *pretest* and *posttest* originate from the same subject. Before testing hypothesis, data can moreover formerly tested its normality For ensure suitability use statistics parametric. Testing hypothesis carried out at the level significance $\alpha = 0.05$.

Hypothesis statistics in study This formulated as following :

H_0 : None influence exercise *squat jump* to ability jump Perseco Club athletes Samahani.

H_a : There is influence exercise *squat jump* to ability jump Perseco Club athletes Samahani.

Basis of taking decision done with compare t - value with t table or use mark significance. If t count more big than t table or mark significance more small from 0.05, then H_0 rejected and H_a accepted. On the other hand , if t counts more small or The same with t table or mark significance more big from 0.05, then H_0 accepted. Based on procedure said, the influence exercise *squat jump* can determined through change ability jump athlete between before and after given treatment.

RESULTS AND DISCUSSION

Research Result

This study was conducted on 16 Perseco Samahani Club athletes to determine the effect of *squat jump training* on jumping ability, which supports heading skills. Data collection was conducted twice: a *pretest before the athletes were given the squat jump training program* and a *posttest after the athletes completed 16 sessions of treatment*. The athletes' jumping ability was measured using a vertical jump *test* .

1. Results of Initial and Final Jumping Ability Tests

Measurement results showed an increase in athletes' jumping ability after being given *squat jump training*. In the *pretest* , the average athlete's jumping ability score was 231.37, while in the *posttest* it increased to 240.31. Thus, there was an increase in the average score of 8.94 after the athletes participated in the *squat jump training program*.

Table 1. Average Results of Pretest and Posttest of Athletes' Jumping Ability

Measurement	Number of Samples	Average value	Improvement
Pretest	16	231.37	-
Posttest	16	240.31	8.94

Table 1 shows that the average jumping ability score for athletes in the final test was higher than that for the initial test. The average score increased by 8.94 points, or approximately 3.86%, compared to the initial ability. This improvement indicates a change in jumping ability after the athletes received programmed *squat jump training over 16 sessions*.

Descriptively, the comparison of *pretest* and *posttest results* can be described as follows: Pretest = 231.37 Posttest = 240.31 Difference = 8.94. These results show that the implementation of *squat jump training* has a positive tendency to increase the jumping ability of Perseco Samahani Club athletes. The increase in value after treatment indicates that the training carried out repeatedly and programmed is able to provide a stimulus to the explosive ability of the leg muscles needed to perform jumps.

2. Hypothesis Testing Results

To determine whether the increase between *the pretest* and *posttest results* statistically indicates the effect of *squat jump training*, a mean difference test was conducted on paired data. The test was carried out by comparing the calculated t value with the t table at a significance level of 0.05.

The analysis results obtained a calculated t value of 5.73, while the t table was 1.76. Thus, the calculated t value is greater than the t table, namely $5.73 > 1.76$. The test results indicate that the null hypothesis (H_0) is rejected and the alternative hypothesis (H_a) is accepted.

Table 2. Hypothesis Test Results

Variables	t Count	t Table	Information
Jumping ability before and after squat jump training	5.73	1.76	H_a accepted

Based on Table 2, it can be seen that the calculated t value of 5.73 is above the critical value or t table of 1.76. This indicates that the difference in jumping ability between before and after training is not only visible from the increase in the average value, but also proven through statistical testing.

Thus, *squat jump training has an effect* on the jumping ability of Perseco Samahani Club athletes. The athletes demonstrated improved jumping ability after participating in the training program compared to before receiving the treatment.

3. Improving the athlete's jumping ability

Improvement in jumping ability can be determined by comparing the average *pretest* and *posttest scores*. The initial average score of 231.37 increased to 240.31 after training. The magnitude of the increase can be calculated as follows:

$$\text{Improvement} = \text{Posttest} - \text{Pretest}$$

$$\text{Increase} = 240.31 - 231.37 = 8.94$$

Meanwhile, the percentage increase in jumping ability is:

$$\text{Percentage increase} = (8.94 / 231.37) \times 100\% = 3.86\%$$

Thus, after receiving *squat jump training* for 16 sessions, athletes' jumping ability increased by an average of 8.94 points, or approximately 3.86%, from baseline. This improvement confirms the results of the hypothesis testing, which showed an effect of *squat jump training* on athletes' jumping ability.

Discussion

Research result show that exercise *squat jump* give influence to ability jump Perseco Club athletes Samahani. This matter indicated by an increase the average value from 231.37 in the pretest to 240.31 in the posttest, with difference of 8.94 or improvement around 3.86%. Test results hypothesis also obtained t - value by 5.73, more tall than mark critical used in study of 1.76. With Thus, the results study show that ability jump athlete after follow exercise *squat jump* during 16 meetings more Good compared to before follow a training program.

In a way theoretical, improvement the can explained through characteristics *squat jump* as exercise explosive member movement down. This movement demand production style in time relatively short through involvement muscles legs at the time do encouragement vertical. In exercise based jump, ability produce style in a way fast is component important For produce *power* legs. Plyometric exercises utilise action fast and able muscles produce adaptation in aspects strength, power explosion, and ability vertical jump (Kons et al., 2023). The study also showed that tall leap vertical is one of the component most consistent performance experience improvement after exercise plyometrics.

Mechanism the help explain changes that occur in athletes Perseco Samahani. When *squat jump* done in a way repetitive and systematic, muscles legs get stimulus for produce style in a way more fast moment do rejection. In movement leap repetitive, phase decline body give load on the structure muscle - tendon which then followed contraction concentric

in a way explosive at the moment body do rejection to above . Mechanism *stretch-shortening cycle* in exercise plyometrics involving storage energy elastic , activity reflex stretching , coordination neuromuscular , as well as interaction supporting muscles and tendons improvement Work mechanical in phase concentric (Kons et al., 2023) . Adaptation neuromuscular and mechanical this is what is theoretical can increase ability athlete in produce more optimal jump .

Plyometric jump training effective increase performance player jumps and sprints football (Ramirez-Campillo et al., 2020) . This matter important Because football No only need Power endurance and skill technique , but also ability produce movement explosive in time short . Improvement ability jump athlete Perseco Samahani after given *squat jump* with thus in accordance with proof that exercise based leap can increase quality physical related with *power* member movement lower player football .

Strength, plyometric and combination training both of them capable give improvements in strength , *power* , speed , *squat jump* , and countermovement *jump*. specifically , improvements in *squat jump* and *countermovement jump* are in the meaningful category after the training program (Oliver et al., 2024) . Findings the give base theoretical that although a athlete have been undergoing routine exercise football , providing physical stimulus additional which is specific directed at strength and power explosion legs still can produce adaptation performance .

Training program plyometrics during six Sunday can increase *vertical jump* , *squat jump* , agility , and speed . The group that gets exercise plyometrics show changes in ability more jumps Good compared to group *control* (Türkarslan & Deliceoglu, 2024) . Findings the relevant with results research on athletes Perseco Samahani Because You're welcome show that exercise explosive the legs that are done in a way programmed capable produce changes in ability vertical player football .

Improvement ability jumping also has relevance direct to need movement heading the ball. Heading the ball in situation games , especially when there was an aerial duel , no only need accuracy contact head with the ball, but also ability player For lift center mass body and achieve position profitable vertical . Jump pattern when player do *heading* No fully The same with leap vertical without the ball. The presence of the ball as the above targets head can changing movement and production strategies style . High performance jump on the test *heading* different around 4.3% compared to leap vertical with prefix without the ball, and *the rate of force development* is also different in a way meaningful (Filter et al., 2022) . This matter show that ability physique For jump is base important , but its

implementation in *heading* still involving coordination and demands more movement specific .

Giving exercise plyometrics twice a week during seven Sunday can increase tall leap in movement *heading* (Matsuda et al., 2024) . Research the important in context study Perseco Samahani Because show existence possible transfer of results exercise from improvement ability explosive member movement lower going to more movement specific in football , namely do leap For heading the ball.

Plyometric exercises in the form of variation *depth jump* and *single-leg jump* increase results leap vertical from an average of 42.4 to 57.2, with results testing statistics show significant difference (Sitompul et al., 2025) . Findings This in a way special put ability *vertical jump* in context *heading* player football and conclude that development Power explosion legs is part important in increase ability player reach the ball in the air . Although form the practice different with *squat jump* in research Perseco Samahani , second study own similarity in principle exercise , namely provide movement stimulus explosive on members movement lower For increase ability jump .

Characteristics physique athlete own connection with performance leap (Pranata, 2022) . Although objects and branches the sport different with research on athletes Perseco Samahani , research the give understanding that ability jump No only influenced by the training program , but can also related with characteristics anthropometrics and conditions physique individual . Therefore , each athlete 's response to exercise *squat jump* can different although they receive the same training program .

View the important in interpret an average increase of 3.86% in the study this . The size change No must understood only from mark the percentage , but also from consistency changes that result in difference in a way statistics between before and after treatment . In sport achievement , improvement ability physique happen as results adaptation to exercise stimulus , while size adaptation can influenced by the level fitness beginning , experience exercise , age , characteristics body , training volume , frequency , and quality implementation movement . Meta- analysis (Oliver et al., 2024) show that player football that has trained still can get improvement strength and *power* through exercise additional , whereas study (Pranata, 2022) show the need consider characteristics body in understand performance jump .

From the perspective programming training , giving treatment as many as 16 meetings in study this also has sufficient basis strong . (Sanchez-Sanchez et al., 2024) , through a meta- analysis involving 1,274 players football , find that *plyometric jump training*

can increase strength maximum and can implemented as part from field training football . Analysis it also shows existence benefit exercises on the program with amount session not enough from and at least 16 sessions . Therefore that is , the total number of meetings in the study was 16 times Perseco Samahani can viewed as dose exercises that allow the occurrence of repeated stimuli and adaptation physical in athletes .

Recent evidence also strengthens that exercise plyometrics and training strength are two effective methods For increase attribute physique athlete sport team . (Zhang et al., 2026) through *systematic review and meta-analysis* against 69 studies with 2,051 athletes teenager man , found that second type exercise the give influence to various component fitness , including *vertical jump* , *horizontal jump* , speed , change direction and strength muscles . Findings the show that improvement ability jump after exercise *squat jump* in research This is at in pattern consistent adaptation with literature more scientific wide about exercise explosive member movement lower .

CONCLUSIONS AND SUGGESTIONS

Conclusion

Squat jump training has an effect on improving the jumping ability of Perseco Samahani Club athletes. This is indicated by an increase in the average value of jumping ability from 231.37 in *the pretest* to 240.31 in *the posttest* , with an increase of 8.94 or around 3.86%. The results of the hypothesis testing also show a calculated t value of 5.73 which is greater than the t table of 1.76, so that H_0 is rejected and H_a is accepted. Thus, *squat jump training* given in a programmed manner for 16 meetings has been proven to improve athletes' jumping ability, which can then support athletes' performance in heading the ball.

Suggestion

Based on the research results, the Perseco Samahani Club coach is advised to include *squat jump training* as a form of physical training carried out in a programmed manner to increase the explosive power of the leg muscles and the athlete's jumping ability. The implementation of the training needs to pay attention to the principles of training load, correct movement techniques, the athlete's physical condition, and recovery time so that the benefits of the training can be obtained optimally and the risk of injury can be minimized. For future researchers, the study can be developed by involving a larger number of samples, using a control group, adding variations in plyometric training, and

measuring the ability to head the ball more specifically, such as the height of the jump when heading, the accuracy of the header, and the success of heading the ball in game situations.

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